

Arkansas Rapid Bioassessment

RAPID BIOASSESSMENTS OF LOTIC MACROINVERTEBRATE COMMUNITIES: BIOCRITERIA DEVELOPMENT

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Abstract

Traditionally, the examination of resident biota has been recognized as perhaps the most straightforward method of assessing water quality since conditions must be favorable for a balanced biological community to exist and perpetuate. Biosurveys are an important method of identifying impairment of aquatic life and can easily be used in conjunction with other biological and chemical monitoring tools in the design of biocriteria. However, from the regulatory standpoint, biological monitoring has had its share of shortcomings. For statewide monitoring programs, the classical intensive quantitative evaluations of biotic communities have been, in many cases, too labor-intensive, time-consuming and expensive. Often, the usefulness of the data has been limited since only aquatic ecologists could understand it.

The increased emphasis on the receiving stream and water quality-based limits created a need for the development of abbreviated methods of generating useful biological data. In the early 1980's, aquatic biologists produced rapid bioassessment techniques and provided information on the concept at the 1986, 1987 and 1988 annual meetings of the North American Benthological Society. Further development of these techniques has continued by numerous state agencies and at the federal level with EPA providing technical guidance (Plafkin et al. 1987). The realization that rapid bioassessments can overcome previously ineffective applications of biological methods is gaining acceptance in the water quality management community. Impact assessment information can now be readily obtained in a cost-effective manner. Rapid bioassessments are useful for screening and as a good starting point when an integration of methods is appropriate.

The primary objective of this report is to convey information pertaining to the validity and reproducibility of a rapid bioassessment technique initiated by the Biomonitoring Section of the Arkansas Department of Pollution Control and Ecology (ADPCE) in 1986. A pilot study was conducted whereby comparisons were made between the complete laboratory analysis of a five-minute riffle samples and field processed 100-organisms rapid bioassessments. Investigator subjectivity was tested through a sampling regime of replicate samples collected at: 1). the same riffle by the same individual, 2). the same riffle by two different individuals, 3). two successive riffles in a minimally stressed stream by the same individual and 4). two successive riffles in a minimally stressed stream by two different individuals. Examples of the data generated from these methods are included in this report. A scoring system, using biometrics, was designed to include

qualitative and semi-quantitative measures of the aquatic macroinvertebrate community to develop biocriteria for determining aquatic life use status. The biometric scoring criteria were structured from data generated by the replicate samples which revealed variations between any two samples taken at the same site.

Various levels of uncertainty have been encountered in the application of numeric criteria due to the complexity of aquatic ecosystems. In some scenarios the so-called "safe number" may not adequately protect aquatic life, while in others, unnecessary regulatory requirements prevail. This does not imply that numeric criteria have no place as a management tool, but their application may be enhanced when supplemented with narrative biological criteria developed from biosurveys of ambient fauna. There is no better way to determine the aquatic life use status of a stream than to examine its inhabitants.

Literature Cited

Plafkin, J.L., M.T. Barbour, K.D. Porter and S.K. Gross. 1987. Rapid bioassessment protocols for use in streams and rivers: benthic macroinvertebrates. U.S. Environmental Protection Agency, Monitoring and Data Support Division. (Draft manuscript)